Claims

[c1]   An electronic payment system that makes electronic money payment relating to a dealing, comprising:

a payment terminal operable to store a first balance of electronic money for said electronic money payment relating to said dealing;

a demanding terminal operable to communicate with said payment terminal to demand said payment; and

a payment apparatus operable to communicate with said demanding terminal and to store a second balance of electronic money to correspond to an identification number of said payment terminal for validating said payment, wherein

said demanding terminal receives from said payment terminal said first balance stored in said payment terminal and transmits said first balance to said payment apparatus, and

said payment apparatus detects unfair use of said electronic money by checking said first balance stored in said payment terminal, which was received from said demanding terminal, with said second balance stored in said payment apparatus.

[c2]   An electronic payment system for making payment on a dealing by electronic money, comprising:

a payment terminal operable to store a first reference number for electronic money for making payment on said dealing by said electronic money;

a demanding terminal operable to communicate with said payment terminal to demand said payment; and

a payment apparatus operable to communicate with said demanding terminal and to store a second reference number to correspond to an identification number of said payment terminal for allowing settlement of said payment on said dealing, wherein

said payment apparatus updates said second reference number in accordance with a predetermined update rule,

said payment terminal receives said update rule of said second reference number from said payment apparatus and updates said first reference number

in accordance with said update rule, and

in a case where said demanding terminal received from said payment terminal said first reference number stored in said payment terminal and then transmitted said first reference number to said payment apparatus, said payment apparatus checks said first reference number, received from said demanding terminal, with said second reference number stored in said payment apparatus to detect unfair use of said electronic money.

[c3]   A payment apparatus that communicates with a payment terminal and a demanding terminal to make settlement on an electronic money payment for a dealing, the payment terminal being operable to store an electronic money balance for making payment on the dealing by the electronic money, the demanding terminal being operable to demand the payment on the dealing, the payment apparatus comprising:

a memory unit operable to store a check balance of said electronic money to correspond to an identification number of said payment terminal;

a communication unit operable to receive, from said demanding terminal, a payment amount of said electronic money to be paid by said payment terminal; and

a processor operable to update said check balance of said electronic money stored in said memory unit based on said payment amount received from said demanding terminal.

[c4]   A payment apparatus as claimed in claim 3, wherein, in a case where said communication unit received from said payment terminal a deposit-requested amount of said electronic money, said processor updates said check balance stored in said memory unit based on said deposit-requested amount, and said communication unit transmits a new balance, obtained by said update, to said payment terminal.

[c5]

A payment apparatus as claimed in claim 4, wherein said communication unit receives the electronic money balance for making payment on the dealing, when said deposit-requested amount of said electronic money is received from said payment terminal, and

said processor compares said electronic money balance said communication unit received from said payment terminal with said check balance stored in said memory unit, transmits said new balance to said communication unit when said compared balances coincide, and notifies a manager of said payment apparatus of a warning indicating a possibility of unfair use when said compared balances do not coincide.

[c6]   A payment apparatus as claimed in claim 3, wherein said communication unit receives from said demanding terminal the electronic money balance for making payment on the dealing, which is notified from said payment terminal, when said communication unit receives, from said demanding terminal, said payment amount to be paid by said payment terminal, and
said processor compares said electronic money balance said communication unit received from said demanding terminal with said check balance stored in said memory unit, updates said check balance stored in said memory unit when said compared balances coincide, and notifies a manager of said payment apparatus of a warning indicating a possibility of unfair use when said compared balances do not coincide.

[c7]   A payment apparatus as claimed in claim 3, wherein, in a case where said communication unit received a balance inquiry request from said payment terminal together with the electronic money balance for making payment on the dealing, said processor compares said electronic money balance said communication unit received from said payment terminal with said check balance stored in said memory unit, and transmits a warning indicating a possibility of unfair use when said compared balances do not coincide.

[c8]
A payment apparatus as claimed in claim 3, wherein said communication unit transmits a balance inquiry request to said payment terminal and receives the electronic money balance for making payment on the dealing from said payment terminal, and
said processor compares said electronic money balance said communication unit received from said payment terminal with said check balance stored in said memory unit, and notifies a manager of said payment apparatus of a warning

indicating a possibility of unfair use when said compared balances do not coincide.

[c9]   A payment apparatus as claimed in claim 4, wherein said memory unit stores a term of validity in relation to said electronic money, and

in a case where said communication unit received said payment amount of said electronic money from said demanding terminal, said processor does not update said check balance of said electronic money stored in said memory unit based on said payment amount, and notifies a manager of said payment apparatus of a warning indicating a possibility of unfair use, when a time that has passed after a start time, at which said communication unit transmitted, to said payment terminal, said new balance of said electronic money based on said deposit-requested amount, has gone beyond said term of validity.

[c10]   A payment apparatus as claimed in claim 3, wherein said memory unit stores an update time in relation to said electronic money at which said check balance of said electronic money was last updated based on a previous payment amount, and

in a case where said communication unit received said payment amount from said demanding terminal, said processor does not update said check balance of said electronic money when a predetermined time has not passed after said update time based on said previous payment amount.

[c11]

A payment apparatus that communicates with a payment terminal and a demanding terminal to make settlement on an electronic money payment for a dealing, the payment terminal being operable to store a check reference number for the electronic money for making payment on the dealing, the demanding terminal being operable to demand the payment on the dealing, the payment apparatus comprising:

a memory unit operable to store a reference number of said electronic money to correspond to an identification number of said payment terminal;

an operation unit operable to update said reference number in accordance with a predetermined update rule;

a communication unit operable to receive, from said demanding terminal, said

check reference number of said electronic money, which said demanding terminal was notified from said payment terminal; and

a processor operable to compare said reference number stored in said memory unit with said check reference number received from said demanding terminal to validate said electronic money.

[c12]   A payment apparatus as claimed in claim 11, wherein, in a case where said communication unit received a deposit request for said electronic money from said payment terminal, said communication unit transmits said update rule for updating said reference number to said payment terminal.

[c13]   A payment apparatus as claimed in claim 12, wherein said update rule uniquely determines said reference number based on an initial value and time information to provide different reference numbers for different initial values or different time information.

[c14]   A payment apparatus as claimed in claim 13, wherein said time information is a time that has passed after a start time at which said communication unit transmitted said update rule to said payment terminal.

[c15]   A payment apparatus as claimed in claim 14, wherein said initial value is an irrational number, and said update rule selects a number at a decimal place of said irrational number as said reference number, said decimal place being determined based on said time information.

[c16]   A payment apparatus as claimed in claim 12, wherein said memory unit stores a number corresponding to the number of times said payment terminal performed dealings using said electronic money, said number being stored to correspond to said identification number of said payment terminal, and said update rule uniquely determines said reference number based on an initial number and said number of times said payment terminal performed dealings in such a manner that said reference number is different when said initial value or said number of times is changed.

[c17]   A payment apparatus as claimed in claim 12, wherein said memory unit stores a term of validity of said electronic money, and

in a case where said term of validity has expired, said operation unit changes said update rule, said communication unit transmits said changed update rule to said payment terminal, and said processor updates said term of validity stored in said memory unit.

[c18]   A recording medium storing a computer program that enables communication with a payment terminal and a demanding terminal for making settlement on an electronic money payment for a dealing, the payment terminal being operable to store an electronic money balance for making payment on the dealing, the demanding terminal being operable to demand the payment on the dealing, the program comprising:

a storing module that enables a computer to store a check balance of said electronic money to correspond to an identification number of said payment terminal;

a communication module that enables the computer to receive, from said demanding terminal, a payment amount of said electronic money to be paid by said payment terminal; and

a processing module that enables the computer to update said check balance of said electronic money based on said payment amount received from said demanding terminal, wherein

said communication module enables the computer to receive the electronic money balance from said payment terminal when receiving a deposit-requested amount of said electronic money from said payment terminal, and

said processing module enables the computer to compare said electronic money balance received from said payment terminal with said check balance, transmit a new balance obtained by said update when said compared balances coincide, and notify a manager of the computer of a warning indicating a possibility of unfair use of said electronic money.

[c19]   A recording medium storing a computer program for enabling communication with a payment terminal and a demanding terminal to make settlement on an electronic money dealing, the payment terminal being operable to store a check reference number of electronic money for making payment on the dealing by the electronic money, the demanding terminal being operable to demand the

payment on the dealing, the program comprising:

a storing module that instructs a computer to store a reference number of said electronic money to correspond to an identification number of said payment terminal;

an operation module that instructs said computer to update said stored reference number in accordance with a predetermined update rule;

a communication module that instructs said computer to receive from said demanding terminal said check reference number of said electronic money, which said demanding terminal was notified from said payment terminal; and

a processing module that instructs said computer to compare said stored reference number with said check reference number received from said demanding terminal to validate said electronic money, wherein

said update rule uniquely determines said stored reference number based on an initial value and time information in such a manner that said stored reference number is changed when said initial value or said time information is changed.

[c20]   A demanding terminal that communicates with a payment apparatus, which settles electronic money payment on a dealing, and a payment terminal, which makes electronic money payment on the dealing, the demanding terminal, which demands the payment on the dealing, comprising:

a first communication unit operable to communicate with said payment terminal and to receive a check reference number of said electronic money from said payment terminal;

a second communication unit operable to communicate with said payment apparatus, to transmit said check reference number of said electronic money to said payment apparatus, and to receive a result of a validation of said electronic money; and

a processor operable to calculate a payment amount of said electronic money to be paid by said payment terminal and to make said second communication unit send said payment amount to said payment apparatus, in a case where said second communication unit received a signal indicating that said validation of said electronic money was successful.

[c21]   A demanding terminal as claimed in claim 20, wherein said processor makes

said first communication unit send said payment amount to said payment terminal in a case where said second communication unit received said signal indicating that said validation of said electronic money was successful, and said processor makes said second communication unit send said payment amount to said payment apparatus in a case where said first communication unit received a confirmation signal for said payment amount from said payment terminal.

[c22]   A demanding terminal as claimed in claim 21, wherein said first communication unit receives, from said payment terminal, an electronic money balance, for making electronic money payment on the dealing, stored in said payment terminal, and said second communication unit sends said electronic money balance stored in said payment terminal to said payment apparatus for validating said electronic money balance stored in said payment terminal with a check balance for said electronic money, stored in said payment apparatus.

[c23]   A demanding terminal as claimed in claim 22, wherein said first communication unit communicates with said payment terminal by optical communication or short-distance communication to receive from said payment terminal an identification number for identifying said payment on the dealing, and said second communication unit communicates with said payment apparatus via a telephone line or a private communication line to send said identification number to said payment apparatus.

[c24]   A demanding terminal as claimed in claim 23, wherein, in a case where said first communication unit received from said payment terminal information regarding a start point, at which a user of said payment terminal started to use said electronic money, said processor calculates the payment amount based on a distance moved by said user from said start point.

[c25]   A payment terminal for communicating with a payment apparatus, which is operable to store a balance of electronic money for making settlement on a dealing by the electronic money, and a demanding terminal, which is operable to demand the payment on the dealing, the payment terminal, which makes the electronic money payment on the dealing, comprising:

a first communication unit operable to communicate with said payment apparatus and to receive, from said payment apparatus, said balance of said electronic money stored in said payment apparatus;

a memory unit operable to store said balance of said electronic money received by said first communication unit;

a second communication unit operable to communicate with said demanding terminal and to receive a payment amount of said electronic money from said demanding terminal; and

a processor operable to update said balance of said electronic money stored in said memory unit based on said payment amount.

[c26] A payment terminal as claimed in claim 25, wherein said first communication unit receives said balance of said electronic money from said payment apparatus in a case where a deposit-requested amount of said electronic money was sent to said payment apparatus.

[c27] A payment terminal as claimed in claim 26, wherein said second communication unit sends said balance stored in said memory unit to said payment apparatus for validating said balance, when sending said deposit-requested amount of said electronic money to said payment apparatus, and receives a new balance from said payment apparatus in a case where said validation of said balance was successful.

[c28] A payment terminal as claimed in claim 27, wherein said second communication unit sends said balance stored in said memory unit to said payment apparatus when a predetermined time has passed after a time at which said new balance was received from said payment apparatus, and receives a result of said validation of said balance.

[c29] A payment terminal as claimed in claim 27, wherein said memory unit stores a term of validity of said electronic money, and

said processor notifies a user of said payment terminal that said electronic money is unavailable in a case where a time that has passed after a start time, at which said second communication unit received said new balance from said payment apparatus, has gone beyond said term of validity.

[c30]   A payment terminal that communicates with a payment apparatus and a demanding terminal to make payment on a dealing using electronic money, the payment apparatus stores a reference number of the electronic money for making settlement on the dealing by electronic money, the demanding terminal demands the payment on the dealing, the payment terminal comprising:
a memory unit operable to store a check reference number of said electronic money;
a first communication unit operable to communicate with said payment apparatus and to receive from said payment apparatus an update rule for updating said check reference number stored in said memory unit;
an operation unit operable to update said check reference number stored in said memory unit in accordance with said update rule; and
a second communication unit operable to communicate with said demanding terminal and to send said check reference number, after being updated by said operation unit, to said demanding terminal.

[c31]   A payment terminal as claimed in claim 30, wherein said first communication unit receives from said payment apparatus said update rule for updating said check reference number in a case where a deposit-requested amount of said electronic money is sent to said payment apparatus.

[c32]   A payment terminal as claimed in claim 31, wherein said update rule uniquely determines said check reference number based on an initial value and time information in such a manner that said check reference number is changed when said initial value or time information is changed.

[c33]   A payment terminal as claimed in claim 32, wherein said time information is a time period that has passed after a time at which said update rule was received by said first communication unit.

[c34]   A payment terminal as claimed in claim 33, wherein said initial value is an irrational number, and said update rule selects a number at a decimal place of said irrational number as said check reference number, said decimal place being determined based on said time information.

[c35]   A payment terminal as claimed in claim 31, wherein said memory unit stores a number of times that dealings using said electronic money were performed, and said update rule uniquely determines said check reference number based on an initial value and said number of times that dealings were performed in such a manner that said check reference number is changed when said initial value or said number of times is changed.

[c36]   A payment terminal as claimed in claim 30, wherein said memory unit stores a term of validity of said electronic money, and
in a case where said term of validity has expired, said first communication unit sends a change request for said update rule to said payment apparatus and receives a changed update rule from said payment apparatus, while said operation unit updates said term of validity stored in said memory unit.

[c37]   A payment terminal as claimed in claim 25 or 30, wherein said first communication unit communicates with said payment apparatus by wireless telecommunication, and
said second communication unit communicates with said demanding terminal by optical communication or short-distance wireless communication to send an identification number for identifying said payment terminal to said demanding terminal.

[c38]   A payment terminal as claimed in claim 25 or 30, wherein said second communication unit receives from said demanding terminal start point information regarding a start point at which a user of said payment terminal starts to use said electronic money,
said memory unit stores said start point information, and
said second communication unit sends said start point information to said demanding terminal so that said payment amount is calculated based on a distance moved by said user from said start point, in a case where said user finishes using said electronic money.

[c39]   A communication adapter, to which a payment terminal for making electronic money payment on a dealing is attached, whereby the payment terminal communicates with a charging system for a toll road, the communication

adapter comprising:

a detection unit operable to detect an electric wave signal transmitted from said charging system; and

a control unit operable to make said payment terminal, attached to said communication adapter, communicate with said charging system by wireless communication to send said charging system a check reference number of electronic money stored in said payment terminal for validation of said electronic money, in a case where said electric signal from said charging system was detected.

[c40]   A communication adapter as claimed in claim 39, further comprising a sound notification unit operable to generate a first sound for notifying a result of said validation of said electronic money, in a case where said result of said validation of said electronic money was received from said charging system.

[c41]   A communication adapter as claimed in claim 40, wherein said payment terminal sends a balance of said electronic money to said charging system, and said sound notification unit generates a second sound for notifying a shortage of said balance of said electronic money, in a case where the shortage of said balance was notified from said charging system.

[c42]   A payment terminal for communicating with a charging system of a toll road to pay toll by electronic money, comprising:

a memory unit operable to store a check reference number of said electronic money;

a detection unit operable to detect an electric wave signal transmitted from said charging system; and

a communication unit operable to communicate with said charging system to send said check reference number, stored in said memory unit, to said charging system, in a case where said detection unit detected said electric wave signal.